

1. A process for etching away a fixed thickness of silicon oxide in an integrated circuit structure on a semiconductor substrate in an etching chamber which comprises:

a) exposing an oxide surface of said integrated circuit structure on said semiconductor substrate in said etching chamber to a nitrogen plasma; and

b) maintaining, on an electrode in said etching chamber, a bias at a predetermined power level during said exposure of said oxide surface to said nitrogen plasma to control the flow of components of said nitrogen plasma toward said substrate;

whereby a fixed thickness of silicon oxide will be removed from said oxide surface, with the oxide thickness removed dependent upon said power level of said bias on said electrode in said etching chamber.

2. The process for etching away a fixed thickness of silicon oxide of claim 1 wherein said electrode comprises a substrate support in said etching chamber.

3. The process for etching away a fixed thickness of silicon oxide of claim 1 wherein said electrode comprises an electrically conductive grid in said etching chamber.

4. A process for etching away a fixed thickness of silicon oxide in an integrated circuit structure on a semiconductor substrate in an etching apparatus which comprises:

a) exposing an oxide surface of an integrated circuit structure on a semiconductor substrate to a nitrogen plasma; and

b) maintaining an rf bias at a predetermined power level on said semiconductor substrate during said exposure of said oxide surface to said nitrogen plasma;

whereby a fixed thickness of silicon oxide will be removed from said oxide surface, with the oxide thickness removed dependent upon said power level of said rf bias on said semiconductor substrate.

5. The process for etching away a fixed thickness of silicon oxide of claim 4 wherein said nitrogen plasma is formed by flowing a gas containing nitrogen into said etching apparatus, and then igniting said nitrogen plasma in said etching apparatus.

6. The process for etching away a fixed thickness of silicon oxide of claim 4 wherein said nitrogen plasma is maintained at a power level of from about 250 watts to about 1000 watts.

Sub 7. The process for etching away a fixed thickness of silicon oxide of claim 4 wherein said nitrogen plasma comprises a remote plasma.

8. The process for etching away a fixed thickness of silicon oxide of claim 4 wherein said power level of said rf bias on said substrate ranges from above zero up to a power level just below a level at which sputtering of said substrate materials would commence.

Sub 9. The process for etching away a fixed thickness of silicon oxide of claim 4 wherein said etching process is carried out in an etching chamber in said etching apparatus maintained at a pressure of from about 1 millitorr to about 1000 millitorr.

Sub 10. The process for etching away a fixed thickness of silicon oxide of claim 4 wherein said oxide surface exposed to said nitrogen plasma comprises an oxide layer previously formed on said integrated circuit structure.

11. A process for etching away a fixed thickness of silicon oxide in an integrated circuit structure on a semiconductor substrate mounted on a substrate support in an etching chamber of an etching apparatus which comprises:

5 a) exposing an oxide surface of an integrated circuit structure on a semiconductor substrate to a nitrogen plasma formed by flowing a gas containing nitrogen into said etching apparatus, and then igniting a plasma in said etching apparatus; and

b) maintaining, on said substrate support, during said exposure of said oxide surface to said nitrogen plasma, an rf bias at a power level ranging from above zero up to a power level just below a level at which sputtering of said substrate materials would
10 commence;

whereby a fixed thickness of silicon oxide will be removed from said oxide surface, with the oxide thickness removed dependent upon said power level of said rf bias on said substrate support.

Sub D1 12. The process for etching away a fixed thickness of silicon oxide of claim 11 wherein said power level of said rf bias on said substrate support ranges from above zero up to about 100 watts.

Sub C4 13. The process for etching away a fixed thickness of silicon oxide of claim 11 wherein said nitrogen plasma is maintained at a power level of from about 250 watts to about 500 watts.

14. The process for etching away a fixed thickness of silicon oxide of claim 11 wherein said nitrogen plasma comprises a remote plasma.

Sub D1 15. The process for etching away a fixed thickness of silicon oxide of claim 11 wherein said etching chamber is maintained at a pressure of from about 1 millitorr to about 500 millitorr.

16. The process for etching away a fixed thickness of silicon oxide of claim 11 wherein said oxide surface exposed to said nitrogen plasma comprises an oxide layer previously formed on said integrated circuit structure.

17. The process for etching away a fixed thickness of silicon oxide of claim 11 wherein said oxide surface exposed to said nitrogen plasma comprises unmasked portions of an oxide layer previously formed on said integrated circuit structure.

18. The process for etching away a fixed thickness of silicon oxide of claim 11 wherein said oxide surface exposed to said nitrogen plasma comprises a surface of one or more oxide portions previously formed on said integrated circuit structure.

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19. A process for etching away a fixed thickness of silicon oxide in an integrated circuit structure on a semiconductor substrate which comprises:

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- a) placing said semiconductor substrate on a substrate support in an etching chamber of an etching apparatus, said chamber maintained at a pressure of from about 1 millitorr to about 500 millitorr;
- b) exposing an oxide surface of an integrated circuit structure on a semiconductor substrate to a nitrogen plasma maintained at a power level of from about 250 watts to about 500 watts and formed by flowing a gas containing nitrogen into said etching apparatus, and then igniting a plasma in said etching apparatus; and
- 10 c) maintaining, on said substrate support, during said exposure of said oxide surface to said nitrogen plasma, an rf bias at a power level ranging from above zero up to about 100 watts;

whereby a fixed thickness of silicon oxide will be removed from said oxide surface, with the oxide thickness removed dependent upon said power level of said rf bias on said semiconductor substrate.

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20. The process for etching away a fixed thickness of silicon oxide of claim 19 wherein said power level of said rf bias on said substrate ranges from above zero up to about 50 watts.

21. The process for etching away a fixed thickness of silicon oxide of claim 19 wherein said oxide surface exposed to said nitrogen plasma comprises an oxide layer previously formed on said integrated circuit structure.

22. The process for etching away a fixed thickness of silicon oxide of claim 19 wherein said etching chamber is maintained at a pressure of from about 1 millitorr to about 200 millitorr.

23. The process for etching away a fixed thickness of silicon oxide of claim 19 wherein said nitrogen plasma comprises a remote plasma.